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FREDERICTON, N.B.

THE FREDERICTON RECYCLING EXPERIENCE:

A CASE STUDY

by

The Department of the Environment

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1. INTRODUCTION

The role of recycling in regional waste management plans is now being defined by municipalities as well as solid waste committees and commissions throughout the province. The purpose of this document is to provide these groups with information on the Fredericton recycling experience. The important components of program design are discussed and the capital and operating costs associated with both residential and commercial recycling operations are identified. Material collection, handling, processing and marketing are also addressed and promotional efforts are described.

2. BACKGROUND

The Fredericton Region Solid Waste Commission operates a sanitary landfill on the outskirts of the City of Fredericton. This facility opened in the summer of 1986 at a capital cost of $2.5 million. Because the Commission is concerned with preserving the life of the landfill a recycling centre became part of the Commission's operations in 1988 for both commercially and residentially generated material. A division of the Commission, SWC Recycling, operates the recycling facility. The sanitary landfill which serves a population of over 90,000 including the city of Fredericton and surrounding area. receives approximately 175 tonnes of waste each day. However, only the urban fraction of the population, approximately 45,700 (1989) was served with recycling services during 1989, the period examined in this study.

The SWC recycling facility consists of a building 100 feet by 50 feet which houses equipment necessary to handle and process paper, plastic and metal. A bunker for recycled glass. consisting of a concrete pad with log supports, is located outside the building. A salvage area for white goods and large metal objects is also located on

site. Paper, plastic, and metal are delivered through the receiving entrances of the building and processed materials leave through the shipping doors.

Commercially generated material is either collected by the Commission or delivered to the recycling facility by private waste haulers. Material generated from the residential sector is delivered to the facility by the contractor for the City of Fredericton. SWC Recycling prepares the material for the market place and then ships it to the end users. The City of Fredericton is responsible for material collection and promotion associated with the Fredericton residential program.

3. COMMERCIAL SECTOR RECYCLING

Material recycled from the commercial sector in Fredericton includes old corrugated cardboard cartons (OCC) and office waste paper. This section of the report will describe the recovery system for each of these materials and the volume of material recovered.

Approximately seven percent of the material generated by the commercial sector in the Fredericton urban area is presently being recycled. In addition 350 tonnes of white goods such as refrigerators and stoves was sold to a metal salvage company in 1989 at five dollars per tonne. White goods are deposited at the site by both householders and private haulers.

3.1 Cardboard Recovery

Two methods are used to recover cardboard. SWC Recycling offers a financial incentive to private haulers to deposit cardboard at the recycling facility. The haulers do not have to pay the $17 per tonne tip fee on clean material and, in addition, are

paid one cent per pound. approximately $23 per tonne. for clean material dropped at the recycling facility. Clean loads of cardboard are also removed from the working face of the site and recycled.

The cardboard brought to the recycling facility is tipped onto the floor and foreign material is removed by hand. The cardboard is then put on a conveyor leading to a shredder and a horizontal baler. The bales, which measure 6.5' by 3' by 2.5', and weigh approximately 454 kilograms are loaded by forklift into a tractor trailer for storage. When the trailer is full it is shipped to the Lake Utopia Paper mill in St. George, New Brunswick where the cardboard is used to make a component of new cardboard called corrugating medium. Although the cardboard is shipped directly to the pulp mill it is sold through Saint John Recycling, a broker for the mill.

The current selling price for cardboard is $85 per tonne delivered. It costs SWC approximately $12 per tonne to transport the material from Fredericton to St. George. Labour required to process the material, transportation and incentive funding for the haulers costs SWC Recycling approximately $70 per tonne leaving $15 to cover overhead expenses. The capital and operating costs of the recycling facility are discussed in section 5.

The cardboard brought to the recycling facility is usually clean with very little waste. However, some contaminants such as packing material including foam and other non-recyclable items are mixed with the cardboard and must be removed before it is placed on the conveyor to the shredder/baler. This waste material makes up an estimated one percent of the total weight of recycled material brought to the facility. This is reflected in the following table.

TABLE 1: OCC RECYCLED - 1989

Month	Tonnes OCC delivered to site	Tonnes OCC Recyclable (Less 1% waste)
Jan	115.5	114.3
Feb	110.0	109.0
Mar	98.6	97.6
Apr	100.6	99.6
May	83.2	82.2
June	65.2	64.5
Jul	65.3	64.6
Aug	85.7	84.8
Sept	72.8	72.1
Oct	73.1	72.4
Nov	75.8	75.0
Dec	74.8	74.0
Total	1020.6	1010.1
Monthly Average	85.1	84.2

During 1989 an average of 84.2 tonnes per month of recyclable cardboard was recovered by SWC Recycling. The seasonal variation in the volume recovered is due to the fact that it is easier to recover cardboard from the working face in the colder months.

The total waste generated in the Fredericton urban area, including residential and commercial material is estimated to be 36,600 tonnes. Of this amount 12 percent is estimated to be cardboard (Bird and Hale, 1979). Based on this assumption an estimated 366 tonnes per month of cardboard is generated in the Fredericton area. On average 84.2 tonnes per month or 23 percent of the total available is being recovered by the recycling program.

The reason for the low volume of material recovered relative to what is available can be attributed to a number of factors. Not all of the cardboard generated is recyclable due to contamination. In addition, not all generators or haulers may not be aware of the recycling system. Another possible explanation is that the $17 tip fee may not provide sufficient incentive for haulers to separate recyclable material. Other jurisdictions, however, have found that increasing the tip fee does not result in the anticipated increase in the amount of material recovered and other measures, such as banning cardboard from the disposal facilities, have had more success.

3.2 Fine Paper Recovery

SWC Recycling collects waste paper from offices throughout the urban area. Two trucks, a one ton and a half ton are used to collect waste paper from office buildings. The larger vehicle is required five days a week and the smaller truck operates three days. Two staff people per vehicle are necessary.

Fine paper is recovered from offices in the City. All government offices participate in the program as well as several private businesses. Office workers are given cardboard carry boxes stamped with information relating to what is and is not acceptable for recycling as shown in Appendix A. These boxes are placed on the floor near each desk. Each staff person is responsible for emptying their own box into strategically placed plastic barrels marked with SWC Recycling and the Recycling logo. Once a week, less frequently for smaller offices, the barrels are emptied by SWC staff.

After the paper is collected it is taken to the recycling depot where it is dumped onto a conveyor system which takes it to a sorting mezzanine. At this upper level three to four people sort the material into four grades of paper: computer print out (CPO);

ledger (basically white writing paper); colour (includes primarily coloured paper) and a very low grade of paper called filler which includes file folders. Each paper type is dropped into the appropriate chute by the staff where it falls into a wheeled container. Once full the paper in the container is baled using a downpress baler. These 2.8' by 2.8' by 3.5' bales weigh approximately 590 kilograms each and are stored in stacks with the use of a forklift until enough material is collected for shipment to a mill owned by Papier Cascade in Kingsley Falls, Quebec. The paper is used to make a variety of paper products.

The selling price of the paper varys depending upon the grade. Colour paper is sold for $150 per tonne, ledger $200. and CPO $250. Filler, valued at $15 - $30 per tonne. is a low grade of paper consisting of material such as file folders and is used to complete a load of higher value material. Transportation costs are paid by the mill.

On average 37 percent of the material obtained from office buildings is ledger, 25 percent is colour, 24 percent is CPO and 14 percent is filler. During 1989 an average of 52.5 tonnes per month of recyclable material was collected by SWC Recycling in their office waste paper recycling program. Approximately two tractor trailer loads of fine paper are shipped each month. Each load of fine paper is the equivalent of 48 bales.

An estimated ten percent of the material collected from offices is waste, non-recyclable paper and other items, which must be landfilled. The following table shows the volume of material recovered on a monthly basis for 1989 and reflects the percentage of non-recyclable material.

TABLE 2: OFFICE WASTE PAPER RECOVERED 1989

Month	Tonnes Recovered Less 10% Waste
Jan	44.5
Feb	46.1
Mar	47.8
Apr	43.2
May	60.1
June	62.8
Jul	49.1
Aug	55.4
Sept	52.4
Oct	56.0
Nov	65.2
Dec	47.0
Total	629.6
Average	52.5

Of the office paper collected by SWC Recycling approximately 60 percent is generated by provincial government offices. Private businesses, schools, universities, the hospital and other institutions make up the remainder of the material recovered.

It is estimated that 2560 tonnes of fine paper are generated annually primarily by the commercial sector in Fredericton. The 629.6 tonnes collected by SWC Recycling represents an estimated 25 percent of the total available. Not all businesses are currently participating in the program and not all grades of fine paper are being recycled.

The average selling price for fine paper is approximately $165 per tonne. It costs SWC Recycling, in terms of labour and equipment only, $125 per tonne to collect and

process one tonne of fine paper. The average selling price is $165 leaving $40 to cover overhead expenses and debt servicing.

4. RESIDENTIAL RECYCLING PROGRAM

Presently in Fredericton 12,000 households are served by a curbside collection recycling program operated by the City. The City does not pay a tip fee on the material delivered to the recycling facility. In August of 1988 material was collected using one state-of-the-art collection vehicle. Residents set out newspaper, glass, and aluminum cans in bags. This program, without intensive promotion or household recycling containers, referred to as blue boxes, resulted in an average participation rate of 28 percent and a diversion rate of four percent of residential waste.

In June of 1989 blue boxes were introduced into the residential program. These blue plastic 45 litre containers are stamped with the recycling logo and "Fredericton Recycles" in white lettering. The boxes were purchased from a company in Ontario called A-1 at a cost of six dollars each.

Blue box recycling containers function as a receptacle to hold household recyclables until pick-up day and serve as a constant reminder in the home. The boxes were delivered to single unit dwellings and apartment buildings with six units or less. The City is presently working with landlords to develop ways of introducing recycling in larger apartment buildings.

4.1 Promotion

Because residential recycling programs require the participation of householders, the effectiveness of promotional efforts is a determining factor in the success of the project. For this reason the City of Fredericton developed a comprehensive promotional campaign in association with the introduction of the blue boxes. An effective, well executed program was introduced during the spring and summer of 1989.

A steering committee was struck to guide the promotional efforts. Membership included City staff, SWC Recycling, the Department of the Environment, and the contractor for the City responsible for collection of the recycled material. It is important that the information given to the public is accurate both from the perspective of the collector and the processor.

The City identified a permanent staff person to oversee the implementation of the program. Three university students were subsequently hired to facilitate the introduction of the boxes and to promote the program during the spring and summer months of 1989. A brochure was developed to describe how to use the blue box, a copy of which is included in Appendix B. Other promotional activities were developed and introduced prior to the launch, and activities intensified during the launch period. Follow-up activities were also carried out.

The type of activities carried out by the summer staff included paid advertisement, both print and radio, as well as news stories in both mediums. A mascot was created to promote the blue box, a hot-line number was set-up and is still in operation, school visits and door to door visits were also part of the promotional campaign. The efforts which proved to be the most effective included school visits and contests, door-to-door visits, the development of a clear and concise brochure, and the hot-line. A report

describing the types of activities undertaken and their effectiveness is available from the City.

The following table shows the costs associated with the promotional campaign carried out in association with the introduction of the blue boxes. The City of Fredericton was responsible for most of the cost for the promotional efforts associated with the launch. However, the Fredericton Region Solid Waste Commission contributed $1500 and $7500 for staff was made available through a federal student employment program. Not accounted for here, however, is the time required for the City's permanent staff person to coordinate the program and the resources required on an on-going basis including the operation of the hot-line.

TABLE 3: EXPENSES ASSOCIATED WITH THE RESIDENTIAL RECYCLING PROMOTIONAL PROGRAM

Summer Staff (3 people for 16 weeks)	$11,000
Pamphlet	
Printing	$1977
Typesetting	$ 500
Paid Advertisement	
Radio	$2524
Print	$1000
Artist	$ 300
Balloons	$ 404
Helium Rental	$ 412
Posters	$ 150
Mascot	$ 225
Feedback Cards	$ 106
Reception	$ 100
Miscellaneous	$ 100
TOTAL	$18,798

4.2 Participation

The overall success of the staff's promotional efforts was evident in the increase in participation rate. The participation rate as measured by the staff was 28 percent prior to the blue box program and promotional blitz. One month after the blue boxes were introduced the participation rate was measured once again. The staff monitored participation by counting the number of households that set their blue box out for collection at least once in a three week period. The overall participation rate increased to 52 percent for the entire City with some areas increasing from 26 percent to 57 percent. The overall increase was experienced despite the fact that many families are away from home during the summer months.

Further evidence of the success of the blue box program and the associated promotional efforts were identified in a Citizen's Attitude Survey conducted that summer by the City on a number of issues. According to that information 70 percent of the residents recycled regularly and over 90 percent were aware of the program.

4.3 Waste Diversion

The rate of diversion from the landfill increased from four percent prior to the introduction of the blue box and accompanying promotional efforts to an average of 11 percent for the six month period after the blue box was introduced. Table 4 shows the rate of diversion both prior to and following the introduction of the blue box program. The diversion rate refers to the amount of material diverted from the waste collected from households in the City, not to the entire waste stream.

As shown in Table 4 the volume of material recovered increased significantly after the blue box was introduced. Approximately ten percent of the material collected in the

blue box program is waste material which cannot be recycled. Table 4 shows the net tonnage recycled after 10 percent waste is removed.

TABLE 4:
RATE OF DIVERSION BEFORE AND AFTER BLUE BOX PROGRAM

Month/ Year	Tonnes Residential Waste Collected	Tonnes Recycled	Percent Recycled
Dec/88	885	38	4
Jan/89	901	38	4
Feb/89	738	34	4
Mar/89	877	46	5
Apl/89	919	46	5
May/89	1433	60	4
Jne/89	1030	77	7*
Jul/89	802	90	11
Aug/89	960	98	10
Sep/89	967	91	9
Oct/89	963	90	10
Nov/89	826	92	11
Dec/89	781	85	11

* Blue Box program introduced mid June 1989

4.3.1 Material Recovery

Approximately 12,000 blue boxes were distributed within the city limits. Based on the six months of data available, for every box distributed an average 17 pounds of material is collected monthly at a participation rate between 50 and 70 percent. On an annual basis this would be 200 pounds per box distributed.

The composition of the material captured by the blue box. based on weight is:

67 % newsprint
27 % glass
4 % mixed plastic containers
1 % aluminum cans
Less than 1 % bags

The following table shows the volume of material captured by the residential program for the last six months of 1989.

TABLE 5: MONTHLY RECOVERY RATES FOR BLUE BOX PROGRAM
(Tonnes)

Month	News	Glass	Plastic	Cans	Bags
July	60.3	24.3	3.6	.9	-
August	66.6	26.4	3.9	1	-
Sept	61.0	25.5	3.6	.9	-
Oct	60.1	24.2	3.6	.9	-
Nov	61.5	25.8	3.7	.9	.6
Dec	56.8	22.9	3.4	.8	.6
TOTAL	366.2	149.1	21.85.	5.4	1.2
Average	61.0	24.8	3.6	.9	.6

On a per capita basis the following amount of material is generated through the blue box program in Fredericton based on a population of 45,700 (1989).

TABLE 6:

PER CAPITA GENERATION RATE OF MATERIALS

Material	lbs/capita/year
News	35.3
Glass	14.4
Plastic	2.1
Aluminum Cans	.5
Bags	.3 *
TOTAL	52.6

* Based on two months of data

4.4 Material Processing

Materials collected at curbside are taken to the recycling facility where they are deposited for processing. Each material is handled differently with specific requirements which must be met in order to be marketable. This section describes how these materials are prepared and shipped. The cost to process this material in terms of labour and equipment are discussed in this section to show how the cost of processing can vary between each material type. However, these costs do not include overhead nor debt servicing. A broader economic analysis is included in section 5.

4.4.1 Newspaper

Newspaper is recovered by the residential blue box program as well as the office waste paper program. Most news is recovered from the residential sector. An average of 61 tonnes of newsprint is recovered monthly in Fredericton. According to waste composition information four percent of the municipal waste stream is made up of newsprint. For Fredericton this would mean that 1462 tonnes of newsprint is available

annually in the waste stream. Presently over 700 tonnes are being collected on a yearly basis. or 50 percent of the amount available.

Newsprint is sorted by SWC staff and paper which is not recyclable such as magazines and other materials are removed by hand prior to baling. It takes two staff people eight hours to sort and bale the news that is deposited daily by the recycling vehicles. Newsprint is baled in the downpress then stored until a shipment is accumulated.

To sort and bale the newsprint costs approximately $40 - $45 per tonne for labour and equipment. The current selling price of the newsprint is $65 per tonne delivered to the mill. There it is used to make the middle layer of boxboard, the type of board used to make cereal boxes, shoe boxes and similar packaging.

4.4.2 Glass

The recycling vehicles dump the glass directly into a bunker outside the recycling facility. Prior to August, 1989 SWC Recycling cleaned the glass and shipped it directly to the Consumers Glass container manufacturing facility in Scoudouc, New Brunswick. This system required two staff people to remove all types of metal and other contaminants such as ceramics from each load of glass brought to the recycling facility. The cost of the labour involved was approximately $30 per tonne. After the glass was cleaned it was crushed by a tractor at a cost of approximately $10 per tonne in labour and equipment. An additional two dollars per tonne was required to pay for equipment to load the material into the trucks. An average of $10 per tonne was required to ship the material from Fredericton to Scoudouc. The cost to process and ship the glass was was $52 per tonne. The selling price of the glass directly to Consumers Glass in Scoudouc was $60 per tonne leaving eight dollars per tonne to cover overhead costs and debt servicing.

In August, 1989 SWC Recycling changed their system for handling glass. Instead of having staff remove metal and other contaminants by hand it was sold to a private business which cleans the glass then sells it to Consumers Glass. The glass cleaning company purchases the glass for $35 per tonne at the SWC site. The only cost to SWC is for crushing the glass. approximately $10 per tonne.

On average one load of crushed glass is shipped per month which is approximately 25 to 30 tonnes. Glass containers make up an estimated nine percent of the waste stream. For the Fredericton urban area this means that an estimated 2600 tonnes of glass would be available in the waste stream from commercial and residential sources. An estimated 11 percent of the total glass available is being collected through the blue box program. A number of factors could contribute to the low recovery rate. Commercial generators such as restaurants, cafeterias, and bars do not have recycling programs in place. The waste composition data is from 1979. Plastic will have displaced glass during the past ten years and this may also contribute to the seemingly low capture rate.

4.4. Plastic Containers

Rigid plastic containers are also collected at curbside and include all types of household plastic containers which have been used to package food, beverages, and cleaners. An average of four tonnes of mixed plastic containers were collected monthly for the seven months of information available. The plastic is stored loose in a shelter behind the main building until it is baled using the horizontal baler. The bales of plastic are stored outside until a shipment is accumulated. Processing of the plastic requires that it be sorted and non-recyclable material removed prior to baling.

The containers are sold to Dow and Domtar in Toronto for $80 per tonne at the SWC facility. The plastic is made into a resin which is then used to make industrial grade packaging.

The sorting requirements for mixed plastic containers is not extensive. Processing, including labour and equipment costs approximately $40 per tonne delivered to the mill.

Plastic makes up approximately five percent of the waste stream by weight, approximately one half of this would be made up of rigid plastics although not all of this would be containers. Based on these assumptions approximately five percent of the rigid plastics available in the Fredericton urban area are being captured through the blue box program.

4.4.4 Plastic Bags

In mid November of 1989 the blue box program was expanded to include white plastic grocery sacks. These bags are baled and sold to PCL and Eastern Packaging in Saint John where they used in the manufacture of new plastic grocery bags. The bags are baled in the downpress at a cost of approximately $30 per tonne in terms of labour and equipment and are sold for $440 per tonne.

Based on the two full months data available for 1989 less than a tonne of material is captured each month. In January of 1990, however, almost one tonne of material was collected. It takes an approximately 100,000 bags to make one tonne. In three months over 200,000 have been recovered. It is estimated that one sixth of the bags available in Fredericton are being captured by the blue box program.

4.4.5. Aluminum Beverage Cans

Aluminum beverage cans make up approximately one percent of the material placed in the blue box. An average of one tonne of material is collected by SWC per month. It is baled in the down press baler into bales which are 33" by 33" by 42" and weigh 160 kilograms at a cost of approximately $40 per tonne for labour and equipment. The bales are picked up by a local metal salvage company. The selling price of aluminum beverage cans fluctuates considerably on a daily basis. During the period of this study the average value was 40 cents per pound or $880 per tonne.

It is estimated that aluminum cans make up one percent of the waste stream. Approximately three percent of the material estimated to be available in the Fredericton region is being collected through the blue box program.

4.5 Residential Collection System

The City of Fredericton pays a private contractor to collect materials from the estimated 12,000 households served by the program. Blue boxes are set out by residents the same day as garbage collection. Residents are encouraged to set out boxes only when they are full to increase collection efficiency.

The driver of the vehicle removes the paper, metal, glass and plastic from the blue box and places each material in the appropriate bin on the side of the vehicle. When one or more of the bins is full the driver empties them into the body of the truck. The trucks are automatic side loading vehicles and a hydraulic system empties the bins into the body of the vehicle. When the materials are subsequently dumped at the recycling facility each material is deposited separately as the dividers in the truck can be

controlled individually. It is important that each material be kept separate in order to facilitate handling at the recycling facility.

Residents who have not properly prepared their materials for recycling receive a response card which has been checked by the driver to indicate what the error was and how to correct the problem. A copy of this response card is included in Appendix C. Because the driver of the collection vehicle is the first point of contact it is important that they be properly trained and know how to respond to problems with material preparation, inquiries from the public, and other quality control issues.

Two state-of-the-art collection vehicles are used by the contractor. One vehicle is a Labrie manufactured in Quebec and the other is a Shupac manufactured in Ontario. Both trucks have a capacity of 30 cubic yards and are designed to be operated by one person. The cost for each collection vehicle is approximately $100,000 and delivery time is one to two months.

The body of the truck is divided into four compartments. These divisions can be adjusted to suit the volume of the materials being collected. At the present time the trucks are divided in such a way that 40 percent of the capacity is for newsprint, 40 percent is for plastic, ten percent is for aluminum cans and ten percent is for glass. The plastic grocery sacks are placed in large plastic bags by the driver and included in the same compartment as the aluminum cans. The contractor feels that the maximum number of divisions possible in these vehicles is five. Occasionally the recycling vehicle has to go to the recycling centre before the end of a run to dump low density materials such as newsprint or plastic.

Although both trucks are adequate for the job, the contractor finds the Labrie vehicle to be superior in design and performance and requires less maintenance than the other vehicle.

In general the public is cooperating quite well. However, some residents set out recyclables after the pick up has been made and the contractor will have to return to that part of the City to collect material. Another difficulty is the placement of materials in plastic grocery sacks. Extra time is required by the driver to open the bags and then sort and empty the contents. Promotion efforts are being implemented to address these two problems.

During 1989 the City of Fredericton paid the contractor $148,000 dollars to collect recyclables. The City does not have to pay the solid waste commission the $17 per tonne tip fee on the materials delivered to the site for recycling. At the present time approximately of 100 tonnes per month are recycled by the residential program. This means that it costs the City approximately $123 per tonne for each tonne of material recycled. It should be pointed out that this is the cost for an urban setting only and the cost would increase in a rural setting where houses are further apart.

5. PROGRAM ECONOMICS

The purpose of this section is to identify the capital costs associated with the processing, collection, and promotion of the recycling program. The responsibility for the program is split between the City and SWC Recycling. This section will summarize the costs both groups are responsible for to give a clear picture of the expenses associated with the program.

5.1 Capital Costs

The capital costs associated with the recycling facility include the cost to construct a proper building and to purchase the necessary equipment. Most of the major pieces of equipment were purchased from a previous recycling operation resulting in lower costs than if new equipment was purchased. It should be pointed out that in February of 1990 SWC Recycling purchased a new baler to replace the two which operated in 1989. As the new baler will handle all of the materials processed by the facility and is expected to be more efficient, operating costs are expected to decrease once the new system is in place.

TABLE 7. CAPITAL COSTS FOR SWC RECYCLING FACILITY

Landscaping	$4,200
Building	$356,937
Furniture and Equipment	$8,102
Recycling Machinery and Equipment	$156,268
Automotive Equipment	$37,892
TOTAL	$563,400

The total capital required for the SWC Recycling facility was $563,400. The New Brunswick Department of the Environment contributed $210,437 of this amount through the solid waste management program leaving $352,962 requiring financing.

The capital costs which were borne by the City of Fredericton included the purchase of the blue boxes and the associated promotion to launch the program. There were 17,000 boxes purchased at $6 each. This resulted in a total capital cost of over $100.000. The associated promotion cost over $18,000 as set out in Table 3.

The Department of the Environment cost-shared the purchase of the blue boxes at 46 percent leaving the City responsible for $54,000. The City also paid for the promotion associated with the blue box introduction. Because most of the salaries for the summer summer staff were paid for by a federal government grant program for students the City actually paid just over $11,000.

The following Table shows the capital cost of both SWC Recycling and the City before and after government contribution. The capital cost of the recycling system in Fredericton including the facility, equipment, blue boxes and promotion was $682,198.67. Forty percent of the capital cost was subsidized by government including the provincial government contribution of over $260,000 and the federal grant for summer staff of approximately $7500 leaving a capital cost of $418,260.81 to be financed by SWC Recycling and the City of Fredericton.

TABLE 8: TOTAL CAPITAL COSTS

SWC Recycling (Facility and Equipment)	$563,400
City of Fredericton	
Blue Boxes	$100,000
Promotion	$18,798
Total Capital Cost before Subsidies	$682,198
Capital Cost after Subsidies	$418,260

5.2 Operating Costs

Costs associated with the operation of SWC Recycling include maintenance costs for equipment and vehicles, utilities, payroll, related expenses, and debt servicing. Twelve people are employed in the sorting and processing of the material handled by SWC Recycling including a working foreman. The functions of the staff depend upon

the requirements of the operation. The average monthly costs associated with the operation of SWC Recycling presented in Table 9 are based on the operating costs associated with SWC recycling for the last six months of 1989.

TABLE 9: AVERAGE MONTHLY OPERATING COSTS AND REVENUES FOR SWC RECYCLING

REVENUES	(20,040)
EXPENDITURES	
Purchase of Materials	
Paper	$1,869
Wire	$264
Containers/Boxes	$595
Wages and Benefits	$18,179
Trucking and Freight	$821
Inventory Adjustment	($300)
Administration and Salaries	$2000
Bank Interest and Charges	$61
Debt Servicing	$5053
Equipment Rental	$238
Maintenance and repairs (eqmt)	$970
Light and Power	$420
Miscellaneous	$182
Printing and Office Supplies	$101
Professional Fees	$226
Small Supplies and Tools	$230
Vehicle Expenses (half ton)	$172
Workers Compensation	$358
TOTAL EXPENSES	$31,739
COST PER MONTH AFTER REVENUES	$11,399

The facility processes approximately 228 tonnes of material each month from both the residential and commercial sectors. Of this amount 90.9 tonnes are captured by the Blue Box program. 84.2 tonnes is cardboard, and 52.5 tonnes is office waste paper. Table 10 shows an estimated annual tonnage and the selling price of each material. Based on a loss of $11,399 per month, after revenue from the sale of material, the average cost per tonne of material handled by SWC Recycling is approximately $50. This cost includes labour, maintenance, overhead, and debt servicing of the capital as outlined above. Collection costs for the recovery of cardboard and fine office paper are included in this calculation while the cost to collect residential materials at curbside are not included.

TABLE 10: ESTIMATED ANNUAL REVENUE BY MATERIAL TYPE

MATERIAL	TONNAGE	AVERAGE SELLING PRICE / TONNE	TOTAL REVENUE
Fine Paper:			
Ledger	233	$200	$46,600
Colour	158	$150	$23,700
CPO	151	$250	$37,750
Filler	88	$30	$2,640
Cardboard	1010	$85	$85,850
Newsprint	732	$65	$47,580
Glass	300	$35	$10,500
Alum Cans	11	$880	$9,680
Plastic	43	$80	$3,440
Bags	8	$440	$3,520
TOTAL	2734		$271,260

The City of Fredericton pays the collection contractor for residentially recycled materials $12,333 per month. Adding this cost to the $11,399 required by SWC Recycling per month the total cost is $105 per tonne. Subtracting the $17 tip fee leaves a cost per tonne of $88 including collection of the residentially generated material.

Collection of residential garbage in the City of Fredericton cost approximately $30 per tonne in 1989. Combined with the disposal cost of $17 per tonne the cost of collection and disposal of garbage was $47 in 1989.

Not reflected in the operating costs is the on-going promotional efforts by the City of Fredericton and the staff time required to carry out that activity. On-going costs related to promotion depend upon how extensively the program was promoted and whether or not a full time staff person was required.

6. ENVIRONMENTAL BENEFITS

Quantifying the operating costs and benefits of any recycling operation would not be complete without mention of the related social and environmental benefits. Recycling has many advantages beyond waste management. Recycling also conserves resources, saves energy, reduces pollution, creates jobs, and increases the awareness of those participating in the program of waste management issues in general.

In terms of waste management the recycling program diverts, in total, seven percent of the Fredericton urban waste stream, the area serviced by recycling programs. This translates into an estimated two years in the extended life of the landfill with a life expectancy of 25 years. Other jurisdictions have found that the extension of a landfill

provided by recycling may, in fact. be greater in terms of volume because bulky material such as cardboard is removed from the waste stream.

On an annual basis the Fredericton program processes the equivalent of almost 50,000 trees. Fourteen people are directly employed full time in the recycling operation in either processing or collecting material. This does not include the time required by the manager and secretary of the Solid Waste Commission nor the time required by the City's staff person to promote the program on an on-going basis. This means that the Fredericton recycling program employs one person for every 200 tonnes of material recycled on an annual basis.

Clearly there are hidden environmental benefits associated with recycling that are not obvious to waste managers. However. these benefits do accrue to society in general and should be considered by decision makers when selecting waste management techniques.

7. CONCLUSION

The costs associated with any recycling program will depend upon the design and efficiency of the operation. This report attempts to define the costs of recycling materials from both the commercial and residential sectors of an urban area in New Brunswick. The amount of material collected by recycling programs tends to increase the longer a program is in operation. In addition, participants from all sectors must be kept informed of modifications and successes related to the recycling effort to maintain motivation. The Fredericton experience provides valuable learning experience to both commissions and municipalities planning recycling efforts throughout the province.

APPENDIX A: OFFICE WASTE PAPER POSTER

SAVE A TREE RECYCLE PAPER

Holder For Recyclable Paper

Yes (acceptable)

Bond Stock
Computer Cards
Computer Printout (without carbon)
Drawings (on paper)
Envelopes (no plastic windows)
Files
Note Paper
Padded Sheets (except backing)
Plans (on paper)
Reports
Reproduction paper (Xerox, IBM, etc.)
Bound Books (if paper acceptable)
Glued edge Reports (if paper acceptable)

NOTE:
Staples, paper clips, plastic report bindings and covers do not need to be removed.
Newspapers and clippings should be stored separately from above papers.

No (unacceptable)

Candy and Gum Wrappers
Carbon Paper
Cardboard
Cigarettes, Cigars etc. & Packaging
Cups and Plates
Envelopes with Plastic Windows
Facial Tissue & Paper Towels
Glass
Gummed Labels & Backing
Lunch Bags and Contents
Magazines
Plastic of Any Kind
Rubber Bands
Shiny Paper
Textiles
Typewriter Ribbons
Waxed Paper

DO YOU HAVE QUESTIONS OR NEED A SPECIAL PICK-UP OF PAPER?

TELEPHONE

S. W. C. RECYCLING

452-9922

SAVE A TREE RECYCLE PAPER

APPENDIX B: FREDERICTON BLUE BOX PROGRAM BROCHURE

Place this handy reminder near your Blue Box

PLEASE REMEMBER . . .

Only newspapers, glass, aluminum cans, and rigid plastic containers are acceptable. Sorry, we cannot recycle food and juice cans, or plastic bags.

Remove caps, corks, lids, and neck rings from glass containers. Rinse out bottles and jars and place them in the bottom of your Blue Box along with aluminum cans and rigid plastics. Tie newspapers and place on top.

Put your Blue Box out only when it is **Full**. This will help us reduce collection costs.

Place your Blue Box at the curb **on the same day as your regular garbage**. The recycling truck may arrive before the regular collection vehicle, so it's important to have recyclables out **before 7:00 a.m.**.

If it's raining or snowing, please keep your recyclable paper inside until the next recycling day.

Don't forget to collect your Blue Box after the recycling truck has passed! With a bit of care it will last a long time

Your Blue Box is not a gift. It remains the property of the City of Fredericton and should be used only for recyclable materials.

We need your help to make our recycling program a success. Together, we can make a difference.

RECYCLE FOR TOMORROW – IT'S EASY TO DO.

WHY IS RECYCLING SO IMPORTANT?

Recycling our waste produces many benefits for our community and the environment.

Through our efforts, we can reduce the amount of solid waste that requires disposal at the sanitary landfill. If we all participate, and recycle as much of our waste as possible, we can add years to the life of our disposal facility.

Once collected, the materials we recycle are transported to the recycling plant located at the regional landfill site. Eleven full-time employees sort, bale or otherwise prepare the items for shipping to companies who use them to manufacture new products.

Reducing our waste through recycling also helps to conserve valuable natural resources. For example, every tonne of newspaper recycled saves 20 trees Recycling saves energy, and reduces the air and water pollution associated with the manufacturing process.

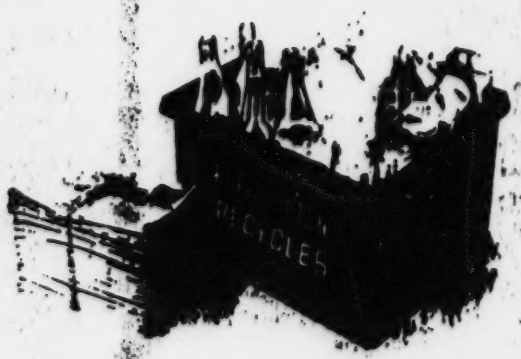
We need your help to make our recycling operation a success. Together we can make a difference

RECYCLE FOR TOMORROW- IT'S EASY TO

PROBLEMS, QUESTIONS OR COMMENTS?
CALL THE RECYCLING HOTLINE AT 453-1648

FREDERICTON RECYCLES

RECYCLE FOR TOMORROW- it's easy to do!



City of
FREDERICTON

The Blue Box is here! With it come some major improvements to Fredericton's recycling program. These changes will make it much easier for everyone in your family to recycle.

The Blue Box provides you with a convenient way to store materials until pick-up day. Placed at the curb, your Blue Box is easy to spot when the recycling truck visits your neighbourhood.

We're also improving the system with changes to the collection schedule. Recycling day will be the same day as regular garbage collection.

The other good news is that rigid plastic containers have been added to the list of materials that can now be recycled.

HOW DO I USE MY BLUE BOX?

Simply place aluminum cans, glass and plastic containers on the bottom of your Blue Box. Stack bundled newspapers on top.

Please help us make the recycling operation as efficient as possible. When your Blue Box is FULL, put it out by 7:00 AM on your regular garbage day. Place it at the curb beside your regular garbage so that the box is clearly visible to the driver of the collection vehicle.

Don't forget to pick up your Blue Box after it has been emptied by the recycling truck. If you have problems, questions or comments, please call the RECYCLING HOTLINE at 453-1648.

WHAT CAN I RECYCLE?

Newspapers

Tie newspapers in bundles or place them in paper bags to avoid windblown paper on our streets. Please do not put newspapers in plastic bags as they cannot be recycled, and tend to slow down collection. Place bundled newspapers on top of your Blue Box.

Sorry, we cannot accept magazines, cardboard boxes, catalogues, and other waxed or glossy paper! Writing paper is acceptable but not envelopes with the plastic windows on the front.

Glass

Please remove caps, corks, neck rings and other metals from glass containers. This helps to improve the quality of materials collected and the efficiency of our operation. It is not necessary to remove labels since they are burned off by the high heat used in manufacturing new glass containers.

Rinse out bottles and jars, and place them loosely in the bottom of the Blue Box.

Only clear glass containers can be recycled. Coloured glass is okay, as long as it is transparent. If you can't see through the bottle or jar when you hold it up to a light, please don't put it in your Blue Box. Ceramics, china, window glass, mirrors or light bulbs are not acceptable.

Aluminum cans

Only aluminum soft drink and beer cans can be recycled at the present time. If you're not sure whether the can is acceptable, use a magnet to check the sides and lid. If it doesn't stick, it's made of aluminum and can be recycled.

Food or juice cans, clothes hangers, spray cans, foil wrap or other metal products are not acceptable at the present time.

There's no need to flatten cans. Just place them in the bottom of the Blue Box. Please do not put them in bags, as this slows down our collection truck.

Plastics

Only rigid plastic containers will be collected for recycling. This includes containers used for foods, health care products and cleansers.

Simply rinse out plastic containers and put them in the bottom of the Blue Box along with aluminum cans and glass containers. It is not necessary to remove caps or labels, because the company which purchases our plastics can recycle these as well.

Please do not put plastic bags, foam, or other plastic wrap in your Blue Box, as they cannot be recycled at the present time.

FREDERICTON RECYCLES

PROBLEMS, QUESTIONS OR COMMENTS?
CALL THE RECYCLING HOTLINE AT 453-1648.

APPENDIX C: BLUE BOX RESPONSE CARD

RECYCLE FOR TOMORROW
It's Easy To Do!

THANK YOU FOR PARTICIPATING IN FREDERICTON'S BLUE BOX RECYCLING PROGRAM. Your effort to recycle is appreciated, but the material left at the curbside today was not picked up because:

___ **YOUR BLUE BOX WAS NOT FULL.** Please wait until your box is full before putting it out for pick-up.

___ **IT WAS LEFT IN A PLASTIC BAG.** Now that you have a Blue Box, using plastic bags is no longer necessary and will reduce efficiency. Please place your glass, aluminum and rigid plastic in your Blue Box. Papers may be tied or put in paper bags and left on top, or placed in the Blue Box in such a way that they cannot be blown around your neighborhood.

___ **IT IS UNACCEPTABLE FOR RECYCLING AT THIS STAGE OF THE PROGRAM.** Only the following materials are acceptable:

PAPERS - newspapers are acceptable but should not be left in plastic bags. Writing paper and envelopes without plastic windows are acceptable. Unfortunately magazines, catalogues, egg cartons, detergent and cereal boxes, cardboard and other waxed or glossy paper (including the shiny flyers in the newspaper) cannot be accepted at this time.

GLASS - only transparent glass is acceptable but this does include colored glass that you can see through (i.e., beer and wine bottles). The lids on jars, bottle caps and all other **METAL** must be removed. As well, all glass jars and bottles should be rinsed before they are put in your Blue Box. Sorry, ceramics, china, window glass, mirrors and light bulbs cannot be accepted.

ALUMINUM/METAL - only aluminum cans can be recycled at this time; these include beer and soft drink cans. Foil wrap is not acceptable, nor are food, juice cans, or any tin cans, clothes hangers, spray cans or other metal products.

PLASTICS - rigid plastics are now being collected for recycling. Acceptable items include plastic soft drink bottles, shampoo bottles, detergent containers, plastic milk jugs and all other hard plastic containers. Please remove metal tops and rinse out all containers before putting them in your Blue Box. Plastic bags and plastic wrap will not be collected.

ANY UNRECYCLABLE MATERIALS IN YOUR BLUE BOX WILL BE LEFT FOR YOU TO PUT OUT WITH YOUR REGULAR GARBAGE THE FOLLOWING WEEK.

THANK YOU FOR YOUR COOPERATION. We know you want to recycle and everyone in Fredericton will benefit as a result of your participation. The Blue Box program will continue to be a success if you can please show your support by following these easy directions.

IF YOU HAVE ANY QUESTIONS, COMMENTS OR CONCERNS, CALL 453-1648